

WHAT IS CLAIMED IS:

1. A rheology-modified, gel-free thermoplastic elastomer composition comprising at least one elastomeric ethylene/alpha-olefin polymer or ethylene/alpha-olefin polymer blend and at least one high melting polymer selected from the group consisting of polypropylene homopolymers and propylene/ethylene copolymers, wherein the rheology modification is induced by a combination comprising 0.075 wt% or less peroxide and a free radical coagent, the peroxide:coagent ratio being 1:4 to 1:20 and the rheology-modified, gel-free thermoplastic elastomer composition having an STI of 15-30, a tan delta at 190°C of 1.05-1.40 and a gel content that is below detectable limits when using xylene as the solvent in ASTM D 2765-90, method B.
2. The composition of Claim 1 in which the peroxide concentration is 0.050 wt% or less.
3. The composition of Claim 1 wherein the peroxide is an organic peroxide.
4. The composition of Claim 1 wherein the organic peroxide is selected from the group consisting of α , α' -bis(t-butylperoxy)-diisopropylbenzene, dicumyl peroxide, di-(t-amyl)peroxide, 2,5-dimethyl-2,5-di(t-butylperoxy)hexyne-3, 2,5-dimethyl-2,5-di(t-butylperoxy)hexane, 2,5 (t-amyl peroxy-2-ethylhexonate), 2,5-dimethyl-2,5-di-(t-butyl peroxy)hexane, di-t-butylperoxide, 2,5-di(t-amyl peroxy)-2,5-dimethylhexane, 2,5-di-(t-butylperoxy)-2,5-diphenylhexane, bis(alpha-methylbenzyl)peroxide, t-butyl perbenzoate, benzoyl peroxide, 3,6,9-triethyl-3,6,9-trimethyl-1,4,7-triperoxonane and bis(t-butylperoxy)-diisopropylbenzene.
5. The composition of Claim 1 wherein the free radical coagent is selected from the group consisting of diallyl terephthalate,

triallylcyanurate, triallylisocyanurate, 1,2-polybutadiene, divinyl benzene, trimethylolpropane trimethacrylate, polyethylene glycol dimethacrylate, ethylene glycol dimethacrylate, pentaerythritol triacrylate, allyl methacrylate, N,N'-m-phenylene bismaleimide, toluene bismaleimide-p-quinone dioxime, nitrobenzene, and diphenylguanidine.

6. The composition of Claim 5 wherein the free radical coagent is selected from the group consisting of triallylcyanurate, 1,2-polybutadiene, divinyl benzene, and trimethylolpropane trimethacrylate.

7. The composition of Claim 1, wherein the ethylene/ α -olefin polymer has polymerized therein at least one α -olefin comonomer, the α -olefin containing from 3 to 20 carbon atoms.

8. The composition of Claim 7, wherein the α -olefin contains from 3 to 10 carbon atoms.

9. The composition of Claim 1, wherein the ethylene/ α -olefin polymer is a diene-modified polymer, the diene being selected from the group consisting of norbornadiene, dicyclopentadiene, 1,4-hexadiene, piperylene or 5-ethylidene-2-norbornene and mixtures thereof.

10. The composition of Claim 1, wherein the high melting polymer is a nucleated polymer.

11. The composition of Claim 1, further comprising a process oil in an amount within a range of from greater than 0 to about 50 weight percent, based on total composition weight.

12. The composition of Claim 1 or Claim 11, further comprising a filler in an amount within a range of from about 0 to about 70 weight percent, based on total composition weight.

13. A process for preparing a rheology-modified, gel-free TPE composition, the process comprising: a) adding at least one peroxide and at least one free radical coagent in a peroxide:coagent ratio of 1:4 to 1:20 and a maximum peroxide concentration of 0.075 wt%, to a molten polymer blend that comprises an elastomeric ethylene/alpha-olefin polymer and a high melting polymer selected from the group consisting of polypropylene homopolymers and propylene/ethylene copolymers; and b) maintaining the polymer blend in a molten state while subjecting it to conditions of shear sufficient to disperse the peroxide and coagent throughout the molten polymer blend, effect rheology modification of the polymers and preclude formation of insoluble polymer gels (determined using xylene as the solvent in ASTM D 2765-90, method B), sufficient rheology modification being measured by an STI of 15-30 and a tan delta of 1.05-1.40.
14. A process for preparing a rheology-modified, gel-free TPE composition, the process comprising: a) adding at least one peroxide and at least one free radical coagent in a peroxide:coagent ratio of 1:4 to 1:20 and a maximum peroxide concentration of 0.075 wt % to at least one component of a polymer blend, before the components are blended, the component polymers comprising an elastomeric ethylene/alpha-olefin polymer and a high melting polymer selected from the group consisting of polypropylene homopolymers and propylene/ethylene copolymers; b) blending the component polymers; and c) converting the polymer blend to a molten polymer blend while subjecting the blend to conditions of shear sufficient to disperse the peroxide and coagent throughout the molten polymer blend, effect rheology modification of the polymers and preclude formation of insoluble polymer gels (determined using xylene as the solvent in ASTM D 2765-90, method B), sufficient rheology modification being measured by an STI of 15-30 and a tan delta of 1.05-1.40.
15. The process of Claim 13 or Claim 14, wherein a sequential step c) follows b), and step c) comprises converting the rheology modified polymer blend into an article of manufacture.

16. The process of Claim 15 further comprising sequential intermediate steps b1) and b2) that precede step c), step b1) comprising recovery of the rheology modified polymer blend as a solid and step b2) comprising conversion of the solid to a melt state sufficient for fabricating the article of manufacture.

17. A process for preparing a rheology-modified, gel-free thermoplastic elastomer article of manufacture, the process comprising: a) adding at least one peroxide and at least one free radical coagent in a peroxide:coagent ratio of 1:4 to 1:20 and a maximum peroxide concentration of 0.075 wt% to a molten elastomeric ethylene/alpha-olefin polymer or elastomeric ethylene/alpha-olefin polymer blend to provide a rheology-modified ethylene/alpha-olefin polymer or ethylene/alpha-olefin polymer blend; b) adding to the rheology-modified polymer or polymer blend a high melting polymer selected from the group consisting of polypropylene homopolymers and propylene/ethylene copolymers to form a composite polymer blend; and c) converting the composite polymer blend into the article of manufacture, the article of manufacture having a smooth surface appearance and a gel content that is below detectable limits when using xylene as the solvent in ASTM D 2765-90, method B.

18. An article of manufacture having at least one component thereof fabricated from the composition of Claim 1.

19. The article of Claim 18, wherein the composition further comprises at least one additive selected from the group consisting of process oils and fillers.

20. The article of Claim 19, wherein the process oil is present in an amount within a range of from greater than 0 to about 50 percent by weight, based on total composition weight.

21. The article of Claim 19, wherein the filler is selected from the group consisting of glass, silica, carbon black, metal carbonates, metal sulfates, talc, clay and graphite fibers.

22. The article of Claim 19, wherein the filler is present in
5 an amount within a range of from greater than 0 to about 70 percent by weight, based on total composition weight.